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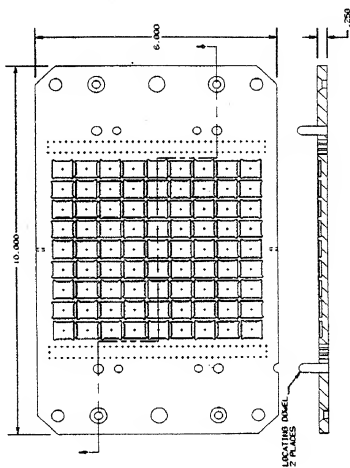


Figure 1 - Typical boat design for the low volume ball attach method.

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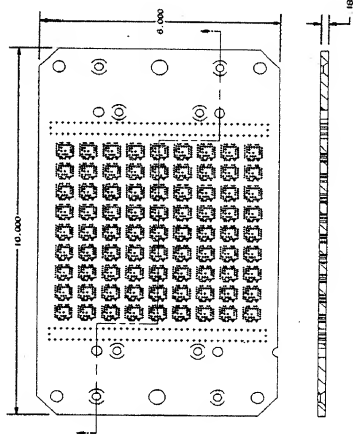


Figure 2 - Typical alignment plate design for the boat shown in Figure 1.

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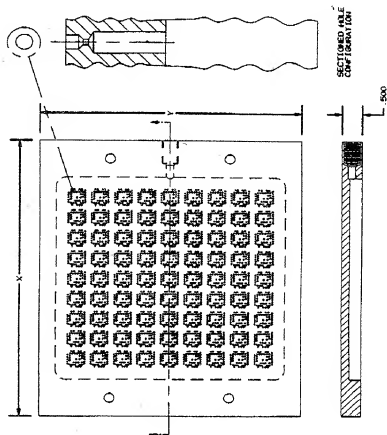


Figure 3 - Typical vacuum loader plate design for the hole pattern shown in Figures 1 & 2. The X and Y dimensions are a function of the hole design (low volume method) or the carrier design (high volume method) as applicable.

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HR 0	MIN 0	SEC 1	VACON	
HR 0	MIN 0	SEC 40	VAC OFF	
HR 0	MIN 0	SEC 42	GAS 2 ON	
HR 0	MIN 0	SEC 50	GAS 2 OFF	(To -10 psig)
HR 0	MIN 0	SEC 52	EXHON	
HR 0	MIN 0	SEC 56	EXH OFF	
HR 0	MIN 0	SEC 58	VACON	
HR 0	MIN 1	SEC 0	HEAT ON	
HR 0	MIN 1	SEC 30	160	
HR 0	MIN 4	SEC 30	160	
HR 0	MIN 4	SEC 32	VAC OFF	
HR 0	MIN 4	SEC 34	GAS 2 ON	
HR 0	MIN 4	SEC 38	GAS 2 OFF	(To 1-4 psig)
HR 0	MIN 5	SEC 0	225	
HR 0	MIN 7	SEC 0	225	
HR 0	MIN 7	SEC 1	HEAT OFF	
HR 0	MIN 7	SEC 30	EXHON	
HR 0	MIN 7	SEC 34	GAS 3 ON	
HR 0	MIN 7	SEC 58	GAS 3 OFF	
HR 0	MIN 8	SEC 0	EXH OFF	

Figure 4 - Typical ball attach soldering profile for 63Sn/37Pb solder material. The temperatures shown in the right hand column are expressed in degrees Centigrade. Gas 2 is 10% hydrogen - 90% nitrogen forming gas pressurized to the indicated gauge pressure values. Gas 3 is dry nitrogen. Dwell time at the 225°C soldering temperature is shown to be two minutes.

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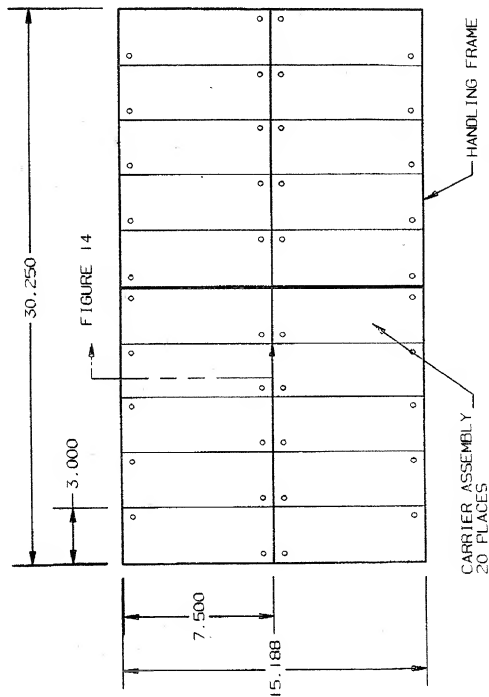


FIGURE 5 - Two fully loaded holding frames positioned end to end. Each frame is shown to contain a total of 10 carrier assemblies configured in two adjacent rows of five assemblies each.

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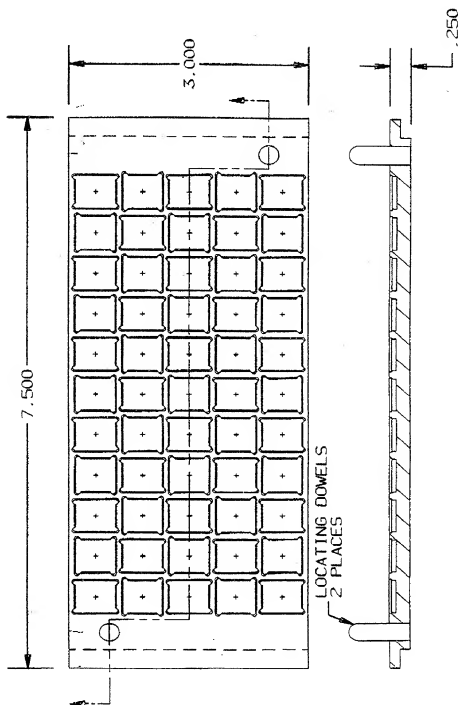


Figure 6 - Typical carrier plate design for the high volume method of ball attach.

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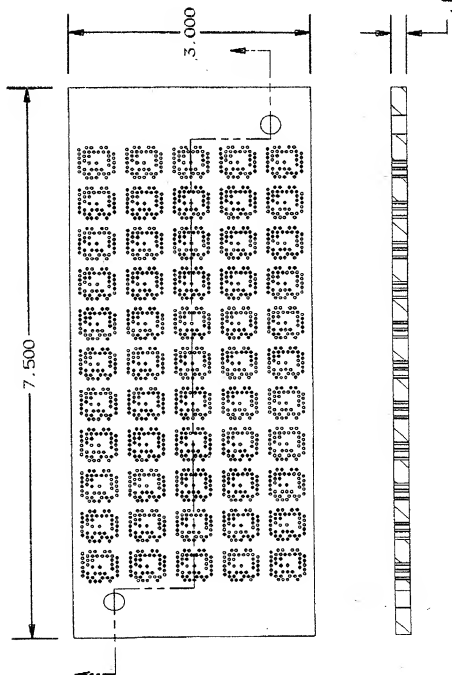


Figure 7 - Typical alignment plate design for the high volume ball attach method. The mating carrier plate is shown in Figure 6.

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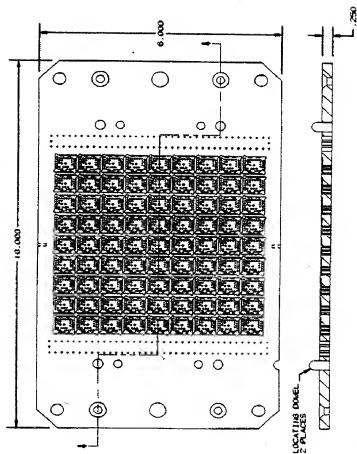


Figure 8 - Typical multipurpose boat design for ceramic BGA packages. The boat is used for the low volume method of die attach, lid seal and ball attach.



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HR0	MIN0	SEC1	VACON	
HR0	MIN0	SEC40	VACOFF	
HR0	MIN0	SEC42	GAS2ON	
HR0	MIN0	SEC50	GAS2OFF	(To -10 psig)
HR0	MIN0	SEC52	EXHON	
HR0	MIN0	SEC56	EXHOFF	
HR0	MIN0	SEC58	VACON	
HR0	MIN1	SEC0	HEATON	
HR0	MIN2	SEC0	240	
HR0	MIN4	SEC0	240	
HR0	MIN4	SEC2	VACOFF	
HR0	MIN4	SEC4	GAS2ON	
HR0	MIN4	SEC5	GAS2OFF	
HR0	MIN4	SEC30	325	
HR0	MIN4	SEC45	GAS2ON	(Backfill to
HR0	MIN4	SEC55	GAS2OFF	-30 psig for
HR0	MIN5	SEC0	325	attach)
HR0	MIN5	SEC1	HEATOFF	
HR0	MIN5	SEC30	EXHON	
HR0	MIN5	SEC34	GAS3ON	
HR0	MIN6	SEC58	GAS3OFF	
HR0	MIN7	SEC0	EXHOFF	

Figure 9 - Typical die attach soldering profile for 80Au/20Sn solder material. The temperatures shown in the right hand column are expressed in degrees Centigrade. Gas 2 is 10% hydrogen - 90% nitrogen forming gas pressurized to the indicated gauge pressure values. Gas 3 is dry nitrogen. Dwell time at the soldering temperature of 325° is shown to be 30 seconds.

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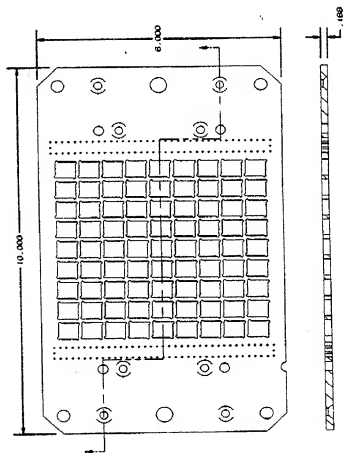


Figure 10 - Typical multipurpose heat plate design for the low volume method of lid seal and ball attach. The mating boat is shown in Figure 8.

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HR 0	MIN 0	SEC 1	VAC ON	
HR 0	MIN 0	SEC 40	VAC OFF	
HR 0	MIN 0	SEC 42	GAS 2 ON	
HR 0	MIN 0	SEC 50	GAS 2 OFF	(To - 10 psig)
HR 0	MIN 0	SEC 52	EXH ON	
HR 0	MIN 0	SEC 56	EXH OFF	
HR 0	MIN 0	SEC 58	VAC ON	
HR 0	MIN 1	SEC 0	HEAT ON	
HR 0	MIN 2	SEC 0	240	
HR 0	MIN 4	SEC 0	240	
HR 0	MIN 4	SEC 2	VAC OFF	
HR 0	MIN 4	SEC 4	GAS 2 ON	
HR 0	MIN 4	SEC 8	GAS 2 OFF	(To 1-4 psig)
HR 0	MIN 4	SEC 30	325	
HR 0	MIN 6	SEC 30	325	
HR 0	MIN 6	SEC 31	HEAT OFF	
HR 0	MIN 7	SEC 0	EXH ON	
HR 0	MIN 7	SEC 4	GAS 3 ON	
HR 0	MIN 8	SEC 58	GAS 3 OFF	
HR 0	MIN 9	SEC 0	EXH OFF	

Figure 11 - Typical lid seal soldering profile for 80Au/20Sn solder material. The temperatures shown in the right hand column are expressed in degrees Centigrade. Gas 2 is dry nitrogen pressurized to the indicated gauge pressure values. Gas 2 is the gaseous atmosphere that is trapped inside the package during the sealing operation. Gas 3 is also dry nitrogen. Dwell time at the 325°C soldering temperature is shown to be two minutes.

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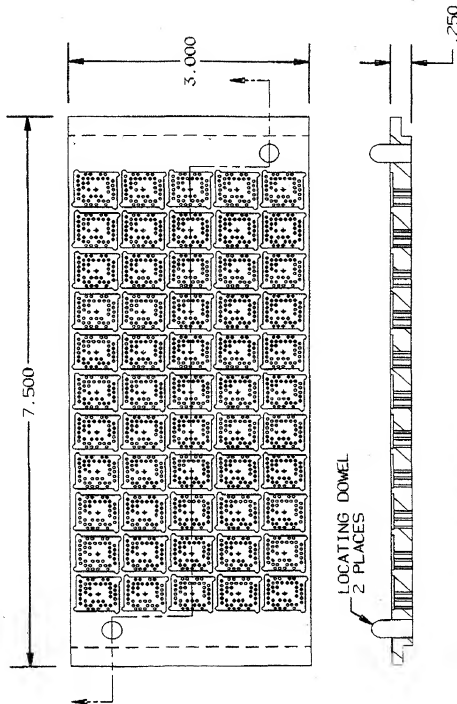


Figure 12 - Typical multi-purpose carrier plate design for ceramic RGA packages. The carrier plate is used for the high volume method of die attach, lid seal and ball attach.

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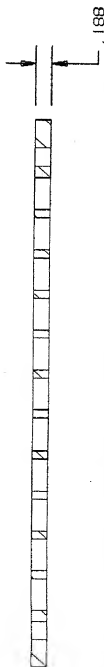
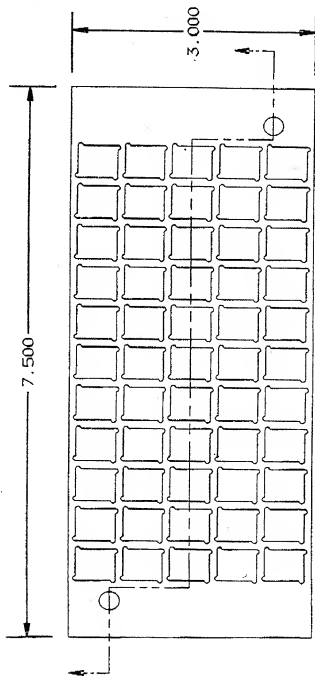


Figure 13 - Lid seal plate design for ceramic BGA packages. The lid seal plate is used for the high volume method of die attach, lid seal and ball attach. The mating carrier plate is shown in Figure 12.

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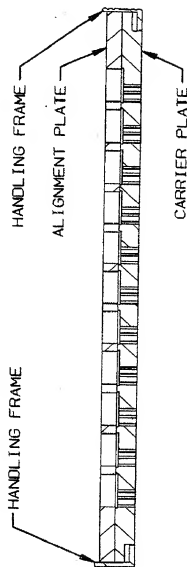
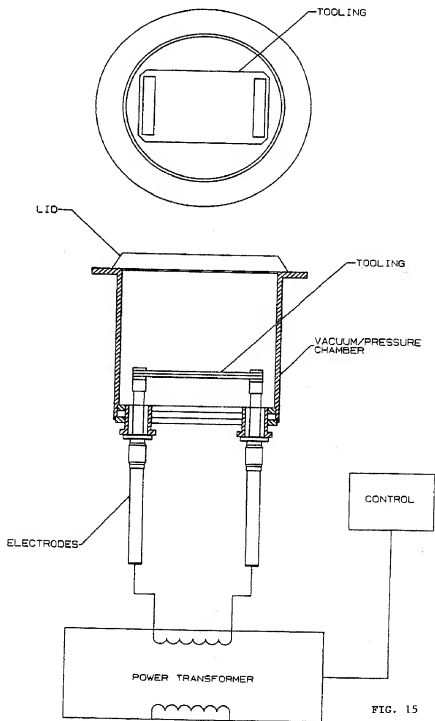


Figure 14 - Handling frame that is fully loaded with multipurpose carrier assemblies and cross-sectioned in the plane referenced in Figure 5.

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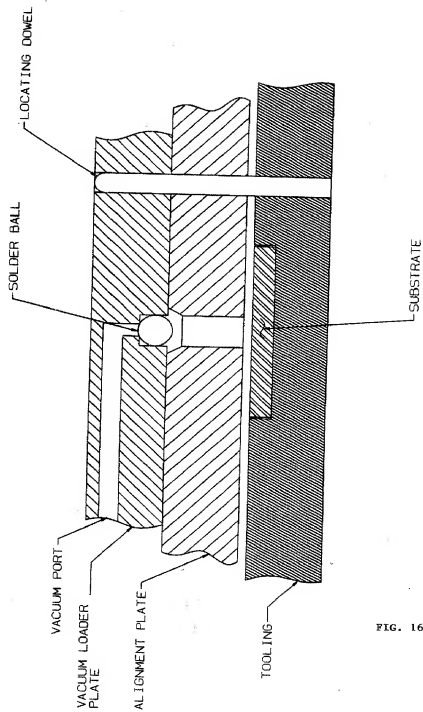


FIG. 16



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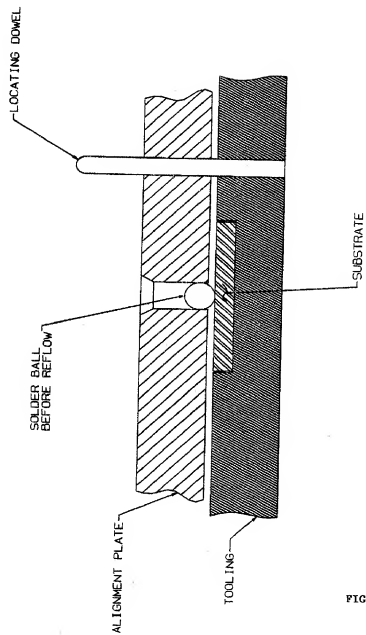


FIG. 17

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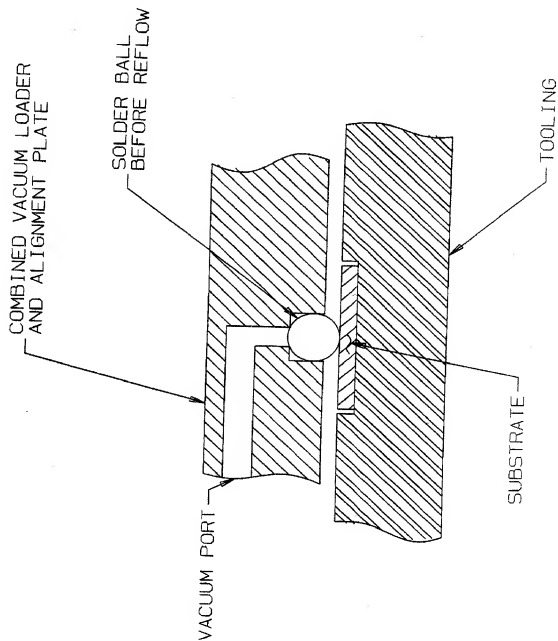


FIG. 18

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SOLDER BALL  
AFTER REFLOW

SUBSTRATE

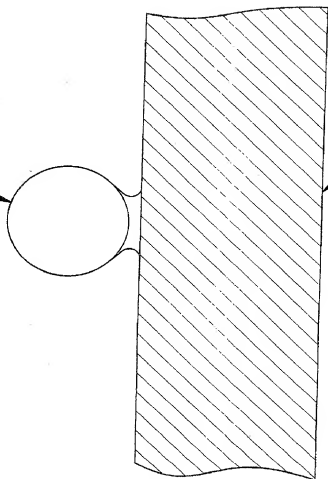


FIG. 19